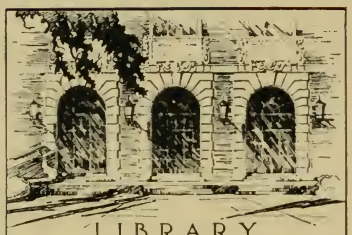

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THE PARLIAMENTARY BILLS COMMITTEE OF THE BRITISH MEDICAL ASSOCIATION.

A MEMORANDUM

ON THE

INFLUENCE OF VACCINATION IN THE PREVENTION AND DIMINUTION OF MORTALITY FROM SMALL-POX.

By ERNEST HART,

Chairman of the Parliamentary Committee of the British Medical Association.

1. The introduction of vaccination was followed by a marked decrease in the small-pox death-rate, and concurrently with the diffusion of vaccination, the small-pox death-rate has further progressively diminished.

Prior to the introduction of vaccination, small-pox was an almost universal disease. Continuously present in all large centres of population, it assumed epidemic proportions at intervals of two to four years, while the smaller towns and rural villages—except such as were exceptionally isolated—were, as a rule, visited by an epidemic of the disease once in every three to six years.* No class of society was exempt from its ravages; and while most fatal in the filthy homes of the poor, yet it spared not the palaces of kings nor the mansions of the rich.† So common, indeed, was the disease, that it was rare for anyone to reach adult life without having passed through an attack.‡ The dread with which it was looked upon may readily be inferred from the eagerness with which inoculation was had recourse to towards the end of the eighteenth century. After the introduction of vaccination, the mortality from the disease underwent a marked diminution. How great this diminution has been in the case of London is shown by the following table.

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* Hillary: *Rational and Mechanical Essay on the Small-pox, London*, 1735.

† Cf. Burnet's *History of William and Mary*, pp. 136, 304; Walpole's *Letters* (April 2nd, 1750); St. Simon; Beserwal; Behse, etc.

‡ Hillary: loc, cit.; Haygarth: *Sketch of a Plan to Exterminate the Natural Small-pox*, London, 1793.

Table showing the Small-pox Deaths per 1,000 *Deaths from all Causes in London from* 1631 *to* 1880.*

Period.	Small-pox Deaths per 1,000 Total Deaths.	Period.	S. P. Deaths per 1,000 TotalDeaths	Period.	S. P. Deaths per 1,000 TotalDeaths
1631-35	48	1741-50	73	1801-10	67
1651-60	59	1751-60	100	1811-20	41
1661-70	39	1761-70	103	1821-30	33
1671-80	66	1771-80	97	1831-40	23
1681-90	76 ⎫ Measles	1781-90	92	1841-50	16
1691-1700	53 ⎭ included.	1791-1800	93	1851-60	11
1701-10	58	...	...	1861-70	11
1711-20	81	...	...	1871-80	19
1721-30	83 ⎫ Inoculation occa-	...	...	1881-82	17
1731-40	77 ⎭ sionally practised	...	...	...	...
	Preinoculation Period.		Inoculation Period.		Vaccination Period.

The table shows that the proportion of small-pox deaths to deaths from all causes, has undergone considerable diminution. It is, moreover, universally admitted that the total death-rate of the metropolis, is now much lower than it was in the seventeenth and eighteeth centuries.* Hence, as the small-pox death-rate has diminished in greater ratio, it is clear that the diminution in the small-pox death-rate must be enormous.

As regards England generally, it is equally certain that the mortality from small-pox is now infinitely less than in prevaccination days, although the absence of registration in the earlier period precludes any accurate statistical comparison. In registration times, however, the mortality from the disease has steadily declined, as the following table shows:

Mean Annual Death-rate from Small-pox per Million living in England and Wales, 1838-79.†

		Compulsory Vaccination.	
1838-42	571	1855-59	199
1843-46	No Returns.	1860-64	190
1847-49	303	1865-69	147
1850-54	279	1870-74	433
...	...	1875-79	82

Some idea of how much less is the present mortality from small-pox than the mortality during the last century, may be gathered from the fact that the average annual deaths from that disease during the seven years 1873-79, in England and Wales, were very slightly in excess of the annual average deaths during the eighteenth century in London alone; the population in the first case being about twenty-four millions, in the second, considerably less than one million.‡

* Calculated from data in Marshall's Bills of Mortality and the Registrar-General's Annual Reports.

† Taylor, P.A.: *Nineteenth Century*, May, 1882.

‡ Total small-pox deaths in England and Wales, 1873-79, 14,566. Annual average, 2,081. Total small-pox deaths in London (within the Bills), 1701-1800, 196,365. Annual average, 1,964.

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2. There is no cause sufficient to explain this diminution in the small-pox death-rate other than vaccination.

It is maintained by some that the decrease in the mortality from small-pox is explained by the improved sanitary condition of the population. Improvement in this respect must undoubtedly have tended to diminish in some degree the death-rate by that disease, but other causes have been at work with an opposing tendency. The population of the country has grown denser, the facility of intercourse has increased a hundredfold, and the movement of the population is incalculably greater now than during the last century. All these latter circumstances necessarily increase the danger of diffusion of infectious diseases, and it is more than doubtful whether the sanitary condition of the people has yet attained such perfection as to neutralise their effect. Moreover, in the case of measles and whooping-cough,* there is not only no diminution, but even a slight increase in the proportion of deaths from these diseases to the total deaths, and if sanitation has had no perceptible effect on these diseases, it is absurd to credit it with a large effect on small-pox, whose contagion is stronger and surer than that of any other disease (Sir Thomas Watson).

3. The manner in which, and the times at which, the diminution chiefly occurred, point clearly to the existence of a causal relation between that diminution and vaccination.

While showing a steady tendency to diminish, the mortality from small-pox underwent the greatest decrease in the periods immediately following the legislative measures for the promotion of vaccination. In 1840, the legislature made public provision for vaccination, and immediately thereafter came a large fall in the small-pox mortality. In 1854, vaccination was made compulsory in England and Wales, and, in the following years, a second marked fall occurred in the small-pox death-rate of these countries. In Scotland, where vaccination was not yet compulsory, the death-rate remained high, being 50 per cent. higher than that of England and Wales in 1855-59, and over 100 per cent. in 1860-64—there being no marked difference in the condition of the two populations other than the absence of compulsory vaccination in Scotland. The enactment of compulsory vaccination in Scotland was speedily followed, as in England, by a large diminution in the small-pox death-rate.† The remarkable sequence of events thus briefly described, amounts almost to a demonstration of the influence exercised by vaccination on the small-pox death-rate.

4. While a marked decrease has occurred in the total small-pox death-rate, a still greater decrease has occurred in the small-pox death-rate among children.

In prevaccination periods, the deaths from small-pox occurred almost exclusively among the very young. Thus, out of 622 total deaths from that disease in Kilmarnock in the 36 years 1728-64, 563 were of children under 5 ;‡ in Chester, in the six years 1772-77, of 378 deaths, 369 were of children under 10, and of these, no fewer than 335 were under 5,§ ; in Warrington, in 1773, of 211 persons

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* Cf. Guy: "Two Hundred and Fifty Years of Small-Pox in London." *Journal of Statistical Society*, September, 1882.

† Cf. Dr. Carpenter's letter on "Small-Pox and Vaccination," addressed to the Right Hon. Lyon Playfair, April 23rd, 1883.

‡ McVail: *An Inquiry into the Prevalence of Small-Pox in Kilmarnock in the Last Century*, Glasgow, 1882.

§ Haygarth ; *loc. cit.*

dead of small-pox, all were under 10, and 199 were under 5*; in Carlisle, in the nine years 1779-87, of 241 deahts, 228 were of children under 5.†

In epidemics of small-pox since the introduction of small-pox, a comparatively small proportion of the deaths occur among children under five, and this proportion has progressively diminished with the diffusion of vaccination. For example, out of 7,982 deaths from small-pox in London in 1871, only 2,945 or 37 per cent. were of children under five. Of 2,371 deaths from small-pox in London in 1881, only 620 or less than 22 per cent. were of children under five.‡

It is therefore clear that of the total small-pox deaths, the proportion occurring among children has been very much less since the introduction of the vaccination than it was before that event. But the total post-vaccination death-rate is much less than the total prevaccination death-rate, hence it follows that the small-pox death-rate among children has undergone an enormous reduction since the introduction of vaccination.

5. In epidemics of small-pox the unvaccinated portion of the community suffers to a much greater extent than the vaccinated. This fact is well illustrated in the case of the year 1882, when small-pox was epidemic in London. During that year 2,371 deaths§ were registered from small-pox. Of these 524 were stated to have been vaccinated, and 962 unvaccinated, while regarding the condition of the others as to vaccination, no statement was made. It is tolerably certain that among the population of London, not more than 10 per cent. are unvaccinated, and if 10 per cent. now be supposed to be doubtfully vaccinated, there will remain 80‖ per cent., presenting clear evidence of vaccination. If then the vaccinated and unvaccinated had been equally liable to fatal small-pox, the former would have died at the same rate as the latter, and since 962 of the unvaccinated died, there would have died 7,696 among the vaccinated. But the actual number of deaths among the vaccinated was 524, hence it is clear that the vaccinated and unvaccinated were not equally liable to death from small-pox.

Moreover, if the mortality among children be considered, the difference between the vaccinated and the unvaccinated appears still more striking. The deaths from small-pox during 1881 included 27 of vaccinated children under the age of five, and 368 of unvaccinated children under that age. If unvaccinated and vaccinated children had been equally liable to fatal small-pox, the vaccinated children would have died at the same rate as the unvaccinated, *i.e.*, (taking the proportion of vaccinated and unvaccinated as previously stated), the deaths among the vaccinated children under five, would have been 2,944. But the actual number was 27, and it is therefore obvious that unvaccinated children are liable to fatal small-pox in an enormously greater extent than vaccinated children, or in other words, vaccinated children are to a large extent protected from fatal small-pox.

Statistics¶ of a similar nature might be multiplied indefinitely and it may be laid down as a fact admitting of no question, that

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* Percival: Essays, medical, philosophical, etc., Warrington, 1789.

† Heysham: Works.

‡ Reports of Registrar-General.

§ *Vide* Registrar-General's Annual Summary for 1882.

‖ This estimate is certainly well within the true proportion.

¶ Cf. Bousquet: *Traité de la Vaccine*, Paris 1883 (Statistics of the Epidemic of Small-pox in Marseilles in 1828, prepared for Soc. Roy. de Méd.); Cross: *History of Norwich* (Statistics of Small-pox in Norwich in 1819); Thomson: *Small-pox* (Epidemic in Quebec, 1819-20), etc. Compare also reports of Sanitary Commissioners in India, *e.g.*, Dr. Little's *Report on Vaccination in Berar* for 1881.

whenever small-pox attacks a community, the unvaccinated part of that community will suffer in enormously greater proportion than the vaccinated.

6. Among persons attacked by small-pox, the mortality is greater in the unvaccinated than in the vaccinated.

The difference in the mortality of the two classes is shown by the following tables, which require no comment.

1. *Mortality from Small-pox among the Vaccinated, Doubtfully Vaccinated, and Unvaccinated.**

	Cases.			Deaths.			Mortality Per Cent.		
	Vaccinated.	Doubtfully Vaccinated.	Unvaccinated.	Vaccinated.	Doubtfully Vaccinated.	Unvaccinated.	Vaccinated.	Doubtfully Vaccinated.	Unvaccinated.
London Small-Pox Hospital (1836–67) †	10,398	263	2,920	790	106	1,043	7.59	40.3	34.9
Metropolitan Asylum Board Hospital ‡...	13,575	2,130	3,973	1,027	671	1,593	7.56	31.5	40.0

2. *Mortality from Small-pox among the Vaccinated, Doubtfully Vaccinated and Unvaccinated, under* 10.

	Cases.			Deaths.			Mortality Per Cent.		
	Vaccinated.	Doubtfully Vaccinated.	Unvaccinated.	Vaccinated.	Doubtfully Vaccinated.	Unvaccinated.	Vaccinated.	Doubtfully Vaccinated.	Unvaccinated.
Metropolitan Asylum Hospitals §	1,291	359	1,512	56	102	745	4.33	28.4	49.2

7. Among the vaccinated attacked by small-pox, the severity of the disease is inversely proportional to the quality of vaccination.

The severity of small-pox is found to vary with the quality of the

* In the statistics of the metropolitan smallpox asylums, the "vaccinated" are those who present marks, however imperfect, of a primary vaccination; the "unvaccinated," those who present no marks, and in whose case it is admitted by the patients themselves or their guardians, that they have never undergone the operation; the "doubtfully vaccinated," those who present no evidence of vaccination, but who profess to have undergone the operation. It is evident that the "doubtfully vaccinated" are really "unvaccinated."

† Marson: Evidence before the Select Committee on Vaccination, 1871.

‡ These include cases admitted into the following asylums:—Deptford, 1878–81; Hampstead, 1876–78; Homerton, Small-pox Hospital, 1871–82; Homerton, Fever Hospital, 1876–77 and 1881–82; Stockwell, 1882. *Vide* annual reports of the several hospitals. For further figures consult report of Board of Health of the City of Philadelphia, 1872; papers on vaccination by Mr. Simon; etc.

§ Homerton Small-pox Hospital, 1871–80; Deptford Hospital, 1878; Stockwell Small-pox Hospital.

vaccine marks. It is found that the more closely the cicatrix resembles the typical cicatrix (*i.e.*, the cicatrix resulting from the performance of vaccination in the best-known way), the less severe is the disease. The fact has been demonstrated by clinical experience, and is clearly illustrated by the following tables.

Classification of Small-pox Cases (Vaccinated) according to the Number and Quality of the Vaccine Cicatrices.

Table 1. *Metropolitan Asylum Board Hospitals,* (Mac Combie).*

	Marks.	Cases.	Deaths.	Mortality Per Cent.
Vaccination Imperfect	1	2,004	341	16.7
	2	2,476	279	11.2
	3	1,778	133	7.4
	4	949	46	4.2
Vaccination Good.†	1	1,095	70	6.4
	2	1,461	51	3.7
	3	1,095	41	3.7
	4	826	23	2.7

Table 2. *London Small-pox Hospital (Marson).* ‡

	Marks.	Cases.	Deaths.	Mortality Per Cent.
Vaccination Indifferent.	1	1,555	353	21.43
	2	1,866	252	12.18
	3	1,161	65	4.77
	4	1,196	37	1.69
Vaccination Good.	1	1,059	34	2.75
	2	1,306	24	1.38
	3	992	14	1.01
	4	1,263	11	.07

Classification of Small-pox Cases (Vaccinated) under 10, *according to the quality of the Vaccine Cicatrices.*§

	Cases.	Deaths.	Mortality Per Cent.
Good Vaccination	372	2	0.53
Imperfect Vaccination	651	49	7.52

7*a*. The value of vaccination is further shown by the almost absolute protection against small-pox afforded by successful revaccination in the adult, following efficient vaccination in infancy.

Revaccination affords protection to those, even, who are constantly exposed to the infection, as the nurses and attendants on small-pox hospitals. During thirty-five years' experience in the London Small-pox Hospital, Mr. Marson never had a nurse or a servant contract small-pox, all having been revaccinated.‖ In the hospitals of the Asylums Board during the last twelve years, small-pox has been almost unknown among the revaccinated members of the staffs.¶ This immunity is not to be explained on the supposition that the majority of these attendants had previously suffered from small-pox, because only a very small proportion of them were thus pro-

* Deptford, 1878–79; Fulham, 1877–78; Hampstead, 1876–78; Homerton Fever, 1876–77; Homerton Small-pox, 1871–78.

† "Good Vaccination" is defined in the Metropolitan Asylum Board Hospitals Reports to mean "a superficial area of not less than one-third of a square inch of one or more cicatrices thoroughly well foveated."

‡ Marson: Evidence before Select Committee on Vaccination, 1871. In calculating percentage mortality, Mr. Marson has deducted those deaths occurring from superadded diseases; this is not done in the previous table.

§ Metropolitan Asylum Hospitals, Homerton Small-pox, 1871–78; Deptford, 1878–81.

‖ Marson: Evidence before the Select Committee.

¶ Sweeting: *Memorandum on Vaccination*, presented to Metropolitan Asylums Board.

tected.* Nor is it to be explained on any hypothesis of "tolerance", because no such tolerance exists among unprotected nurses exposed to fever;† and those members of the staff of small-pox hospitals who had not been successfully revaccinated, and who had not already had small-pox, contracted the disease.‡

Further illustration of the protective power of revaccination is furnished by our own army and navy,§ and by the German as contrasted with the French army during the Franco-Prussian War. ‖

8. Vaccination does not, in the vast majority of cases, endanger the life of, or cause injury to, the individual submitted to it.

It has occasionally been alleged that the operation of vaccination may be the means of conveying the poison of syphilis to the child submitted to it. That this risk may exist under exceptional combinations of circumstances may readily be admitted; but, seeing that syphilis can be produced only by its own specific virus, the inoculation of that disease in the operation of vaccination is compatible only with the grossest carelessness on the part of the operator. In England, the risk, if it exist at all, is certainly infinitesimal, and in no single instance have the Government inspectors of vaccination been able, after the most rigid inquiry, to find one single case of syphilis after vaccination. ¶

In a small proportion of cases, the operation of vaccination is followed by erysipelas. When this occurs, however, it is, in most instances, due to avoidable circumstances, and in no case is it directly dependent on the vaccine virus. Moreover, the cases in which it occurs are so exceedingly rare that no reasonable man would hesitate, on account of this risk, to have his child vaccinated.

9. The facts adduced in the foregoing statement demonstrate that, by conferring protection against the most virulent of all contagious diseases, vaccination annually saves thousands of infant lives; and that its inestimable benefits are obtained at the cost of an infinitesimal amount of suffering.

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* At Fulham, out of a staff of 295, only 42 had previously had small-pox, at Stockwell, 16 out of 340 had been patients at Homerton (during eleven years) 34 were selected from old patients; at Deptford, 20 out of 265; and on the *Atlas*, 3 out of 161. *Vide* Sweeting, *loc. cit.*

† At Homerton Fever Hospital, *e.g.*, during the two years 1881-2, when typhus was somewhat prevalent in London, 14 members of the staff contracted the fever, of whom 2 died. *Vide* Reports for 1881 and 1882.

‡ *Vide* Sweeting: *loc. cit.*

§ *Vide* Hart: *The Truth about Vaccination*, pp. 57, 58, 74 and 75.

‖ Total deaths from small-pox in German army (where revaccination was rigorously enforced), 263; in the French army (where revaccination was neglected), 23,469. Cf. Cohn: *La Variole.*

¶ Cf. Stevens: BRITISH MEDICAL JOURNAL, December 1879, p. 956.